DOCUMENT RESUME

ED 292 467 IR 013 220

AUTHOR Maher, Thomas G.
TITLE Television-Centered, Instructional Delivery Systems: Costs and Case Studies. A Review of Research.
PUB DATE 1 Jun 82
NOTE 20p.
PUB TYPE Information Analyses (070) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adult Education; Cable Television; Case Studies; Communications Satellites; *Continuing Education; *Costs; *Distance Education; *Educational Television; Higher Education; Models; *Television Research; Videodisks; Videotape Recordings
IDENTIFIERS Instructional Television Fixed System

ABSTRACT

This paper reviews the post-1975 research on the capacities, logistics, and costs of the various delivery technologies used in educational television, and details case studies of television-centered operations, particularly in relationship to adult learners. The paper begins with a section on general definitions and the capacities of various delivery technologies. The next section describes cost methods and model systems, and includes a discussion of the general cost of telecourse program production. A review of case studies of individual technologies is then presented, followed by a separate discussion of those studies that use a mix of television delivery systems. A final section suggests directions for future research. The systems that are examined are the broadcast technologies of open broadcasting, instructional television fixed service (ITFS), and satellites; cable distribution, both one way and interactive; and copy systems using open reel and cassette videotape and videodiscs. Sixty references are listed. (EW)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED292467

# TELEVISION-CENTERED, INSTRUCTIONAL DELIVERY SYSTEMS: COSTS AND CASE STUDIES

A Review of Research

THOMAS G. MAHER

Media Director
Chaffey Community College

June 1, 1982

IR013220

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Thomas C. Mahar

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

## INTRODUCTION

Educational television has come to play a major role in higher education in America. The recent figures from a study done by the National Center for Educational Statistics and the Corporation for Public Broadcasting show that 71% of the institutions of higher education in the United States use television in some capacity (Dirr et al., 1981). However, this burgeoning use of television for instruction raises some important questions for educational planners and decision-makers. In a presentation to the annual meeting of the American Educational Research Association, Richardson (1981) outlines several areas in television-centered delivery systems that require exploration. One of these is the need for a review of research on the capacities, logistics and costs of the various delivery technologies, and on the case studies of their respective operations, particularly in relationship to adult learners.

This paper attempts to address that need. Because costs of television systems are greatly influenced by advances in the technology, this review is limited to research published after 1975. In addition, this is not meant to be an inclusive survey. Early studies summarized in later work are omitted. This review also concentrates on television systems in the United States. International projects have created massive amounts of valuable raw data, but the particular and often unique circumstances of each international effort limit their value in American applications. A comprehensive listing of these projects can be found in Young et al. (1980, pp. 162-233). Finally, only those case studies concerning higher and postsecondary, continuing and adult education, and which contain actual rather than projected cost data, have been included.

This paper begins with a section on the general definitions and capacities of various delivery technologies. The next section describes cost methods and model systems, and includes a discussion of the general cost of telecourse program production, which can be a constant, recurring factor regardless of delivery system. A review of case studies of the individual technologies is presented next, followed by a separate discussion of those studies that use a mix of television delivery systems. A final section suggests directions for future research. The systems that are examined are the broadcast technologies of open broadcasting, instructional television fixed service (ITFS), and satellites; cable distribution, both one direction and interactive; and the copy systems of open reel and cassette videotape and videodiscs.

Although Richardson (1981) is interested in the way these delivery systems can be used to meet the particular needs of adult learners in distance learning situations, very few of the reports make those connections. Consequently, this review has included studies that provide basic system information, but which may require the reader to apply the system to adults.

## GENERAL DEFINITIONS AND CAPACITIES

All the television-centered delivery systems offer education two basic services. First, they enhance instruction by adding information such as interviews with experts, particular demonstrations or exposure to locations and events that cannot be adequately conveyed by the written or spoken word. Secondly, they can greatly expand the audience for instruction (Munshi, 1980a). However, each system has its own requirements and peculiarities.

Dordick, Bardley & Fleck (1979) divide the television-centered delivery systems into three broad groups: over-the-air transmissions, cable distribution and copy technologies. Over-the-air transmissions, consisting of broadcasting, Instructional Television Fixed Service (ITFS) and satellite relays, are broadly defined as the modulation of electro-magnetic radiation, in line-of-sight transmissions, that diminish over distance. These systems are also direct delivery technologies: materials must be used at the time of transmission. Broadcasting uses signals that only require a standard television to receive, while ITFS and satellite relays need special reception equipment at each site that is expensive ($10,000-$30,000). Although broadcasting reaches 60-75% of all schools and is relatively low cost when used with a large number of receivers, and for each additional student, these advantages for education are offset by several problems, such as limited appropriate programming and schedule problems caused by single channel direct delivery. ITFS and satellite relays remove these disadvantages because they are capable of multi-channel distribution. They also have two-way audio capability. While ITFS is limited to a range of 25 miles, a satellite can distribute over an area, called a footprint, of hundreds of thousands of square miles and also has two-way video capability.

Cable distribution systems are defined by Dordick et al. (1979) as electro-magnetic transmissions, through wire or optical fibre cables, to fixed locations. These signals can be regenerated along the cable and are unaffected by typography, so they can theoretically cover greater distances than some over-the-air transmissions. While cable systems require tremendous capital costs for installation, they have a high quality signal, often have interactive, two-way audio and video capability and can offer programming flexibility because of their multi-channel capacity (12-108 channels).

The copy technologies of videotape, both open reel and cassette, and videodisc, are physical delivery systems, rather than electro-magnetic transmissions. The program information is electronically recorded on the magnetic coating of videotape, in the grooves of capacitance videodiscs or in laser images on optical videodiscs. Videotape offers both recording and playback capabilities and, in helical format videotape, stop-motion. Videodiscs, while capable of playback only, offer complete stop motion, slow motion and rapid random access to any portion of the disc program. Videodiscs currently suffer from a lack of technical standardization and

availability of programming. All the copy technologies require physical transportation to the instructional site and the costs of administering the distribution may be greater than the individual system hardware. However, copy technologies offer great flexibility and are an inexpensive way to start a television-centered delivery system.

Analysis of the strengths and weaknesses of these delivery systems (Instructional Television: A Comparative Study, 1976) concluded that broadcasting was the best choice in high density population areas. Satellite delivery was judged to be the most effective with remote populations distributed over large areas and when broadcasting several hours of programming. Cable was the cost-effective choice for multi-channel distribution, if the cable was already in place. However, this study found ITFS was cheaper if a new delivery system had to bear the high cost of cable installation. In situations that required scheduling flexibility, program choice and variety, videotape on cassettes was the preferred choice. Similar conclusions were reached by Graff (1980) and Shulman (1981). Haque (1978) and Curtis (1979) provide useful summary charts of the capabilities of each technology.

However, these reports do not relate the use of television-centered delivery systems to a particular audience, let alone to the needs of adult learners. Luskin (1980) makes a brief and general reference to the capacity of these delivery systems to expand the "campus" of higher education. Baltzer (1980, 1981), while not providing any definitive answers, asks some central questions about television-centered, as well as other alternative delivery systems and their relationship to the adult learner. These questions are concerned with the nature of the intended audience, the requirements of course content, the cost-effectiveness of each system and the availability of appropriate programming. Once these questions are answered, the best system, or mix of systems, can then be chosen (Baltzer, 1981).

## COST METHODS AND MODEL SYSTEMS

### *COST METHODS*

At first blush, determining the costs of televised instruction would seem a fairly straightforward task. However, as Schramm et al., noted as late as 1967, in The New Media: Memo to Educational Planners,

> It is necessary to admit with regret...that we simply do not have available at present the necessary data with which to treat in any very sophisticated way the comparative educational efficiency of the new media in terms of cost....In the next five or ten years, let us hope, much better data and measures will be available. (pp. 122-123)

While the actual costs and case studies summarized by Schramm et al. (1967) are both outdated and outside the higher education focus of this review, the problems encountered in this cost study illustrate the difficulties inherent in comparative cost analysis. The authors fault the basic data as incomplete, unsystematic and lacking in sufficient detail. Budgets often cover more than actual expenditures and existing facilities and equipment are rarely taken into account. Large variations exist in funding, financing and accounting for joint and shared costs. Many projects are not completely new additions to existing systems and may reduce costs elsewhere. Finally, they note the general difficulty of defining educational inputs and outputs for comparisons between systems. An additional critique of media cost studies (Carnoy & Levin, 1975) pointed out that reported costs in the literature were often projected, rather than historical costs. Also, data were usually supplied by the agency conducting the project and therefore open to some question. Also noted as problems were the tendency of researchers to "give the benefit of the doubt" to the new media and that often complex formulas obscured data that were intrinsically flawed. In 1976, Carnoy attempted to correct these flaws by creating a formula for both cost-effectiveness and cost-benefit analysis. However, the international case studies used to exemplify his methodology are hard to interpret, because only the largest categories of expenditures are used and because costs are given in national currency. This study is significant because it attempts to offer a method of quantifying the effectiveness of mediated instruction, in order to correlate effectiveness and cost. This study also provides some cost comparisons of educational television in international settings.

Working from a methodology developed for general educational costing (Coombs & Hallak, 12972), Jamison and Klees (1975) and Jamison et al. (1976, 1978) created a relatively simple, but exhaustive, set of formulas for cost-analysis of educational television systems that expresses final expenditures in both cost per student and cost per student per hour of instruction. The application of these methods in analyzing the cost of the Stanford ITFS project will be discussed below (Jamison et al., 1978). Although the system is for K-12, another good example of the application of this cost analysis method is the study done of the ITV project in American Samoa (Schramm, Nelson & Betham, 1981).

McCabe (1979) also provides a general formula for determining costs in non-traditional education via television. This report indicates that serving a new clientele through television requires the creation of a new system, rather than the replacement of lectures with television programs. Costs for educational television are divided into three areas: development or acquisition of materials, delivery system and organization, and actual delivery of services. Unlike Jamison et al. (1978), McCabe's formula provides a cost per student per course. He also has a summary chart comparing traditional education to television-centered instruction, showing the cost per course of traditional education between $75-$100 per student and $40 per student for television. A recent, brief article by

Van der Drift (1980) also works on a cost method for educational television that expands McCabe's (1979) cost breakdown. This study presents four cost areas: development and design of materials, production, distribution or delivery and presentation. However, Van der Drift arrives at a cost per student per hour, as Jamison et al. (1978), rather than per course (McCabe, 1979). Van der Drift reports student per hour costs of $2-$6. He also reports non-broadcast product costs of $245-$1,995 and broadcast quality production costs of $15,000-$35,000 for half hour programs.

In addition to cost-analysis methods, another important consideration is the manner in which educational institutions are compensated for television students. Goldstein (1980) summarizes the issues of financing ITV on both the federal and state levels. He notes that governmental policies dealing with instructional television are conspicuous by their absence and concludes that what policies exist discourage both students and institutions from investing in instructional television. Excepting the support provided by the National Institute for Education and the Fund for the Improvement of Postsecondary Education, Goldstein cites the restrictions on reimbursement to students for ITV courses by the Veterans Administration and the fact that the 51 state and federal statutes on student grants and loans generally ignore ITV. Additional negative factors include the lack of uniformity in the accreditation of ITV coursework and state aid formulas for institutional funding that do not permit a full count for ITV students. Goldstein & Soloman (1981) and Goldstein (1982) provide summaries of recent federal budget cuts in ITV support.

Munshi (1980b) discusses the primary sources of income from ITV: tuition, state full-time equivalent reimbursement and lease/purchase fees for institutions producing telecourse packages. Munshi cites an average tuition range from $34-$83 per student per course, with breakeven enrollments ranging from 10-250 students per course. Lease/purchase arrangements range from fee-only leases averaging $32 per student, to purchase agreements averaging $3,000 per telecourse for three-year, unlimited use. In studying 19 colleges and universities that used ITV, Munshi (1980b) found that 12 broke even or made money, while seven lost money. She concluded that television courses are cost-effective only with tax support through state aid or grant funding or when compared to traditional on-campus instruction. Munshi and Stone (1980) provide a universal formula for institutions to determine their particular breakeven enrollment for a telecourse.

## *MODEL SYSTEMS*

Some of the research encountered in this review attempted to create, and then cost out, model systems for different delivery technologies. Models for individual delivery systems are discussed under the appropriate section below. Although advances in technology and the recent ravages of inflation render most of the actual cost figures obsolete, this group of studies provide useful guidelines and formats for planners interested in creating

their own systems. Current salary surveys, such as those undertaken by the International Television Association (ITVA Salary Survey, 1981), the Corporation for Public Broadcasting (Salary Report, 1980) and Video-writer ("Freelancer", 1981), can provide current salary levels for television personnel. In addition, equipment magazines such as Educational and Industrial Television, Videography, Audiovisual Communications and Broadcast Management and Engineering, have intensive listings of hardware manufacturers and vendors, as well as publish semi-annual, comparative equipment listings for cameras, videotape recorders, lights, monitors, transmitters, etcetera. These current costs can then be fitted into the appropriate categories in the models.

The Educational Policy Research Corporation of Syracuse University developed a statewide model for each of the television-centered delivery systems (Instructional Television, 1976). Assuming a base of 1,400 schools, the costs of their models range from $51,488,900 for a videotape system to $8,909,250 for an open broadcasting system. The mixed cable and videotape model was $25,633,340, while the cable model alone was $20,069,450. The costs of the other models were $20,225,750 for satellite delivery and $17,134,680 for ITFS. Broadcast programming for six hours per day was calculated at $3,240,000. Programming cost for each of the other systems was $12,960,000. The authors also itemized cost categories for major system components, such as personnel, equipment for production, distribution and reception, programming and administration.

This report concluded that programming costs were the dominant cost feature of each model. Satellite distribution appeared to have the highest degree of sharable costs to the schools. Scheduling flexibility and local control were judged to be the central factors in teacher acceptance. The authors also noted that the existing communications infrastructure in a particular area was very relevant to the type of system that should be chosen. An early report on model systems (Cost Study, 1968; Sovereign, 1969) provides detailed cost categories for television-centered delivery systems at the local, city, metropolitan, state and regional levels that would be useful in projecting cost areas for future systems. However, the actual cost data are obsolete.

Some cost elements, such as programming and production costs, remain relatively constant regardless of the actual delivery system. Munshi & Stone (1980) outline four levels of complexity in the production of a standard 30-program, 30-minute-per-program telecourse and the costs and production time of each level. National telecourses, such as The Growing Years, cost between $600,000 and $1,000,000 and take up to two years to develop and produce. Project: Universe and Oceanus: The Marine Environment, designed for a regionaL/national audience, cost $400,000-$600,000 and take 12-18 months. At the local/regional level, a telecourse such as Family Portrait may cost $200,000-$400,000 and have a 6-12 month production time. Local productions, Home Gardener, for example,

may cost $75,000-$200,000 and be completed in three to six months. Munshi & Stone also list the members of the teams for design, print and television production and validation. Their information is confirmed in similar reports by the Dallas County Community College District (ITV Closeup, 1979), Shulman (1981), Walker (1979) and Zigerell et al. (1981).

Munshi & Stone (1980) also cite a cost of $30,000 and a six-month timeline for the production of the "wraparound" instructional print materials for existing television series such as Cosmos and The Adams Chronicles. Those figures are confirmed by Richardson (1979). Variations in telecourse lease/purchase agreements, ranging from fees of $34 per student, to purchase arrangements for unlimited use, averaging $3,000 per telecourse, are reported by Munshi (1980b) and Beatty (1979).

The major cost components in telecourse production are equipment and personnel. Stalcup & Hall (1978) summarized the costs associated with the operation of a television production studio. They found the capital equipment for a broadcast studio ranged from $500,000 to $2,500,000. Personnel cost varied from $250,000 for a staff of 20, to $600,000 for a 50-person, large station. Operating budgets were $50,000-$200,000. In closed-circuit studios, capital costs were $30,000-$500,000. Staff costs were $30,000-$278,000 and operating funds were $80,000-$700,000. Dordick et al. (1979) report similar figures. Stalcup & Hall (1978) also concluded that a closed-circuit studio, both large and small, could produce programs at a cost of $5,000-$5,500 each.

## INDIVIDUAL SYSTEMS AND CASE STUDIES

### *BROADCASTING*

### OPEN BROADCASTING

Although the oldest television-centered delivery system is live, open broadcasting by public and commercial television stations, videotape production techniques have effectively eliminated this system in a "pure" form. Open broadcasting is now almost a completely "mixed" system, combining broadcasting with videotaped programming. In addition, educational institutions that use broadcast, videotaped telecourses usually make copies of those programs available to students who were unable to view the program during the broadcast time. McAuliffe (1978) reported on seven community colleges in Connecticut that apparently rely only on broadcast telecourses. The annual budget for the delivery of six telecourses was $25,000. The lease fees per course, per college ranged from $50 to $500. McAuliffe also noted that the operation became self-sustaining at a fee base of $40 per student per course.

## INSTRUCTIONAL TELEVISION FIXED SERVICE (ITFS)

In a 1979 report, Curtis delineated in detail the technology of ITFS. He also computed an annual cost per student for ITFS serving adult learners. Per student costs for graduate school operations averaged $114.25 and $13.61 for medical schools. He also cites an average of $5.67 per student in K-12. He attributes the wide range of annual per student costs to the larger populations using ITFS in K-12 and medical schools. Curtis (1979) concluded that ITFS is the most cost-effective of the broadcast delivery systems.

Lent (1977) compared ITFS with live lecture, videotaped lecture and independent study. Based on 2,500 students per semester, he found per student per course costs of $96 for ITFS, $195 for live lecture, $83 for videotaped lecture and $95 for independent study. Lent also reported that although ITFS had the highest initial investment, it had the lowest cost for additional courses.

One of the most complete case studies of ITFS for adult education is provided by Jamison et al. (1976, 1978). This study involves a cooperative effort between Stanford University, Golden Gate University, the College of Notre Dame, San Jose State University and several business locations in the greater San Francisco Bay area. Students can earn various certificates and degrees through this program, including a Master's degree in engineering. Jamison et al. include complete cost data and comparative tables on the setup and operation of the Stanford system. They arrive at an over cost per student per hour of $5.70 to $6.80, depending on the capital interest rate used in the cost equations. A report using more recent data (Instructional Television, 1976) noted a cost per student per hour of $1.63. Jamison et al. also discuss the relative importance of the interactive component of ITFS instruction and briefly mention that, although the system is designed to broadcast live lectures, some students can view tapes of these classes at other times. They also note that the capital costs of this system compares favorably to a new ITFS facility constructed by the University of Southern California ($750,000, Dordick et al., 1979). The cost per student per hour of the USC operation has been reported at $5.01-$11.13 (Instructional Television, 1976).

## SATELLITES

Satellite delivery is effectively a mixed distribution system. There are no reports of any attempts at live broadcast instruction, using satellites as relays. Polcyn (1979) outlines the results of the Educational Satellite Communications Demonstration with the three Applications Technology Satellites (ATS) used in experiments in Alaska, Appalachia and the Rocky Mountains during the early 1970's, and appends an extensive bibliography on those efforts. Polcyn cites hourly satellite transmission costs ranging between $90-$430, depending on amount of use and time of day. That general range was confirmed by Graff (1980) and West (1980). Polcyn also

provides costs for earth station receivers from large, 10-meter receivers for both two-way audio and video for $400,000, to small, two-meter, audio only receivers for $15,000. West (1980) cites similar costs. A recent article indicates that satellite relay charges have been reduced ("SECA to Feed", 1982). The Public Broadcast Service, through its Public Service Satellite Consortium, offers satellite time for instructional television at $148 per hour.

One of the most extensive instructional satellite systems currently reported is the operation of the Appalachian Community Service Network (ACSN), a continuation of the Satellite Demonstration Project (Gaudreau & Perrit, 1981). Summarizing the work of Bramble (1976-1977), Gaudreau & Perrit report a cost of $2,070.37 per student per course. They note that while the experimental nature of the project causes high cost, they compare this figure with the $1,624 per student per course in traditional clases at the University of Kentucky. Using Satcom-1, the authors project a per student per course cost of $350 when the system is fully operational. The system is designed for adult learners in both graduate and undergraduate courses and for continuing education for engineers and nurses. The system incorporates leased telecourses, with support from classroom discussion groups and some location production. Recent updates on ACSN ("ACSN Delivers", 1981; "Alaska Low Power", 1982) indicate that the network is moving to Satcom-111R and will be offering its courses nationwide over cable.

*CABLE*

Curtis & Pence (1979) describe the development of cable, including the rules and regulations of the FCC governing cable operation. In particular, they delineate the requirements for educational access channels on systems over 3,500 subscribers. They summarize several case studies, including a comparison of ITFS and cable in the Shawnee Mission Public Schools of Kansas City, Kansas. Although a K-12 system, and outside the direct scope of this review, the cost comparison for these delivery systems is significant, since costs other than delivery were essentially equal. The cost per student per hour was $4.40 for cable delivery, compared to $5.12 for ITFS. They also summarize the interactive cable project for senior citizens in Reading, Pennsylvania ("Test and Evaluation", 1976), but do not provide any cost information.

A negative experience with interactive cable in an adult education context has been reported (Greene, 1979) about the Warner Communications QUBE system in Columbus, Ohio. This study outlines the general costs and operation of the Higher Education Cable Council that was formed by six local colleges in the Columbus area. These colleges leased program material. Greene found the essential failure of the system due in large measure to lack of institutional support and not taking full advantage of the system's interactive capability.

## *COPY SYSTEMS*

### VIDEOTAPE: OPEN REEL AND VIDEOCASSETTE

Because of the popularity of videocassettes, both in the 3/4 inch and 1/2 inch formats, open reel videotape is primarily used for the regional and national distribution of telecourses in broadcast format, two-inch videotape (Munshi, 1980b). The State University Resources for Graduate Education Project (SURGE) of Colorado State University (Wagner, 1975) did operate on the basis of videotaping regular lectures. The question of format or open reel or videocassette is not addressed. Adult learners could receive an MA in business, engineering and some of the sciences through the SURGE project. Wagner does an extensive cost analysis of the videotape project and reports a cost of $4.30 per student per hour.

### VIDEODISC

Wood & Wooley (1980) compare regular, fixed-pace television with the videodisc. They provide detailed explanations of each videodisc system and outline capabilities and limitations. Their charts show price comparisons for both home and industrial versions of videodisc systems, ranging from $400-$4,000. This report also has an annotated bibliography on the uses of videodiscs and an extended general bibliography. They conclude that the random access, stop and slow motion capabilities of videodiscs hold great promise for educational programming, but they note that the technology needs standardization.

## *MIXED SYSTEMS*

Many of the operations of television-centered instructional systems use more than one method of delivery. As noted earlier, some systems such as open broadcasting, open-reel videotape and satellites are, or have become, inherently mixed modes. The most common mix is the supplementary use of videocassettes of broadcast telecourses to provide learners with the opportunity to review programs, or to initially view programs that were missed during the broadcast schedule.

The University of Mid-America and its associated colleges use this mix of broadcast and tape (Sell, 1975; Kiesling, 1979). Kiesling does a complete cost analysis of the historic expenditures for UMA and campuses in Iowa, Nebraska and Missouri. He derives a per student per course cost of $410 for Iowa, $196 for Nebraska and $722 for Missouri. The Iowa enrollment was 318 students, Nebraska - 1,516 and Missouri - 344. Operating at maximum capacity, Kiesling estimates a per student per course figure of $96 for Iowa, $54 for Nebraska and $53 for Missouri. He also provides an extensive cost chart comparing open universities and traditional education and concludes that television instruction is 20%-30% cheaper than traditional, undergraduate lectures. Finally, Kiesling compares the per

student per course costs at UMA to the $39-$69 figure for the British Open University, and the $48 cost at Chicago's Television College.

Another project using a mix of open broadcasting and tape is the Wayne State University Studies and Weekend Course Program (Feinstein & Angelo, 1977). Designed to "provide an educational environment for working adults" (p. 3), the entire project is structured to fit the work schedules and other time constraints of the adult learner. The cost per student, $65 (Goldin & Bear, 1979), confirms the general range reported for UMA.

Stepp (1981) reports a program in South Carolina that uses ITFS broadcasts with videotape and interactive telephone connections, in which adults can earn an MBA or an MS in engineering. The cost of the higher education component of the South Carolina project, reported by Goldin & Bear (1979), was $103.70 per student. The cost per student per course for all students (1,691,699) in the South Carolina system was $5.83.

In 1979, the Alaska State Department of Education undertook an examination of the programming, management and costs of eleven instructional television networks in the United States (Goldin & Bear, 1979). This report summarizes the total capital costs, network operating expenses and costs of the instructional television component. Goldin & Bear also analyze the comparative strengths and weaknesses of each network. They conclude that instructional television can accommodate a wide variety of learners, in both distance and urban settings. They indicate that in selecting a delivery system, consideration must be given to the interrelation of target audience, total system services and local education institutions, because no single system seems superior. They also note that the most effective use of instructional television exists where it is supported by local educators who participate in the decision-making process. Finally, Goldin & Bear found that, while the cooperation of instructional television with public broadcasting seems the most workable arrangement, some learners have programming and schedule needs best served by local, non-broadcast distribution.

Goldin & Bear provide raw cost data and a bibliography on each system. The categories of expenditures reported are large, but useful for comparisons. The following summary shows their derived cost per student for those networks offering higher (H.E.), continuing (Cont. Ed.) and adult basic education (A.B.E.). Although not specified, comparison with other data indicates that these are per course, rather than annual costs.

| NETWORK | H.E. | Cont. Ed. | A.B.E. |
|---|---|---|---|
| California | $78.75 | | |
| (Coastline Comm. College) | | | |
| Maryland | $315.58 | $33.00 | $4.14 |
| South Carolina | $103.70 | (Teacher Cont. Ed = $120.82) | |
| Kentucky | $426.00 | | $39.00 |
| Oregon | $108.00 | | |
| Indiana | $65.00 | | |
| Univ. of Mid-America | $1,097.00 | | |

(After Goldin & Bear, 1979, pp. 32-35)

Lists of the institutions in the United States that use television-centered instructional delivery systems are available in Munshi (1980b), Gruebel and Robinson (1980), Dirr (1981) and Lewis (1982).

## CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

The primary conclusion that appears indicated by this review is that conclusions about the actual costs of any of the delivery systems discussed are not possible. Schramm's call, in 1967, for uniform, accurate, complete and comparable cost data has been echoed by investigators in this field ever since (Carnoy, 1976; Jamison & Klees, 1975; Jamison et al., 1976, 1978; Lent, 1977; Van der Drift, 1980; Munshi, 1980b).

And it is not as though the methodology needs development. Five years after the first work of Jamison & Klees (1975) and Carnoy & Levin (1975), Munshi (1980b) still finds that each "institution seems to have had difficulty devising a cost accounting system that reflects its costs and revenues accurately and none of the accounting systems was comparable to another" (p. 23). Even with "comparable" categories such as costs per student per hour, the variations, from several cents to hundreds of dollars, seems to indicate that some organizations are efficient in the extreme, or that the raw data are not extremely efficient at reflecting the actual costs.

While comparisons of cost between projects are important, a more critical area of comparison is overall cost with educational effectiveness. Only one study (Carnoy, 1976) made any attempt to match system costs with educational outcomes. The potential economies of television-centered delivery systems, particularly in large-scale applications, are irrelevant without a method of correlating those economies with the learning effectiveness of each system. Without some kind of correlation method to determine true "cost-effectiveness," comparisons of different delivery systems with each other, or with traditional education, seem somewhat pointless.

Another problem for educational planners is the transient nature of cost data. The rapid advance, particularly in the last two to three years, in the sophistication of the delivery hardware obsolete cost figures as fast as they

are published. And inflation and regional differences make personnel salary data almost as ephemeral. In addition to monetary figures, a method of quantifying costs in terms of technical specifications for hardware and person hours (weeks, months, etc.) by job category should be developed for reporting case study information and for use in model systems design. This would slow, to some degree, the obsolescence of monetary figures and provide both technical and personnel benchmarks for the creation of new systems. The models themselves need extensive updating, to reflect the advances in both the technology and production techniques.

The literature contained no reports on the actual development of a telecourse. Only the gross figures on development and production of programming for higher education projects are available. Case studies outlining the actual line item costs, time for each production process, number and kinds of personnel required, etcetera, are needed to provide a base of raw data on which to build.

Finally, few of the delivery systems described in the model or case study material seemed designed for the needs of adult learners, yet of those that reported information about their students, the majority were usually adults. And none of the studies covered in this review even mention the possibility of unintended consequences (Richardson, 1981), let alone examine those possibilities. For television-centered delivery systems to fulfill their promise, our expectations and the requirements of shrinking funds and emerging new populations of learners, we have to understand all the capabilities and limitations, all the costs, of these methods, in order to apply them in the most effective and efficient fashion.

## REFERENCES


ACSN Delivers Higher Education Programming for Adults Via Cable. Telescan, 1981, 1(2), p.2.

Alaskan Low Power TV Receives ACSN Programs. Telescan, 1982, 1(2), pp.2-3.

Baltzer, Jan A. Expanding Alternative Delivery Systems. Arizona: Rio Salado Community College, 1980. (ERIC Document Reproduction Service No. ED 208722) [N.B. hereafter ERIC documents cited by ED no. only]

_____. Implementation of Alternative Delivery Systems: One Problem Down...Three to Go. Arizona: Rio Salado Comunity College, 1981. (ED 208723).

Beatty, Sally V. Forming College Television Consortia. In R. Yarrington (Ed.), Using Mass Media for Learning. Washington, D.C.: American Association of Community and Junior Colleges, 1979. (ED 165856).

Bramble, William J., & others. A Follow-Up Report on the Appalachian Educational Satellite Project. Journal of Educational Technology Systems, 1976-1977, 5, 81-94. (Abstract)

Carnoy, Martin. The Economic Costs and Returns to Education. In R. Arnove (Ed.), Educational Television: A Policy Critique and Guide for Developing Countries. New York: Praege, 1976.

Carnoy, Martin, & Levin, H.M. Evaluation of Educational Media: Some Issues. Instructional Science, 1975, 4, 385-406.

Coombs, Phillip H., & Hallak, Jacques. Managing Educational Costs. London: Oxford University Press, 1972.

Cost Study of Educational Media Systems and Their Equipment Components, Volume II, Technical Report. Washington, D.C.: General Learning Corp., 1968. (ED 024286).

Curtis, John. Instructional Television Fixed Service: A Most Valuable Educational Resource. In J. Curtis and J. Biedenback (Eds.), Educational Telecommunications Delivery Systems. Washington, D.C.: American Society for Engineering Education, 1979.

Curtis, John, & Pence, Clifford. Cable Television: A Useful Tool for the Delivery of Education and Social Services? in J. Curtis and J. Biedenback (Eds.), Educational Telecommunications Delivery Systems. Washington, D.C.: American Society for Engineering Education, 1979.

Dirr, Peter L., Katz, J., & Pedone, R.J. Higher Education Utilization Study Phase I: Final Report. Washington, D.C.: Corporation for Public Broadcasting, 1981.

Dordick, Herbert S., Bardley, Helen G., & Fleck, Glenn. ITV: A User's Guide To the Technology. Washington, D.C.: The Corporation for Public Broadcasting, 1979.

Feinstein, Otto, & Angelo, Frank. To Educate the People: An Experimental Model for Urban Higher Education for the Working Adult. Detroit, Michigan: Center for Urban Studies, Wayne State University, 1977. (ED 146880).

Freelancer Tops Fee and Salary Survey. Videowriter, No. 6, November/ December, 1981, pp. 1-2.

Gaudreau, Susan L., & Perrit, Lea J. An Innovative Education Modality - The Satellite System. Paper presented at the Lifelong Learning Research Conference, February 7, 1981. (ED 200816).

Goldstein, Michael B. Federal Cuts in Student Aid Programs Pose Risks for Instructional Telecommunications. Telescan, 1982, 1(4), pp. 1;3.

_____. Federal Policy Issues Affecting Instructional Television at the Postsecondary Level. In M. Kressel (Ed.), Adult Learning and Public Broadcasting. Washington, D.C.: American Association of Community and Junior Colleges, 1980. (ED 181985).

Goldstein, Michael B., & Salomon, Kenneth D. Federal Dollars Down, But Entrepreneurs May Flourish. Telescan, 1981, 1(2), pp. 1;3.

Goldin, Lawrence, & Bear, Becky. Comparisons of Selected Instructional Television Networks: Programming, Management and Funding Models. Juneau: Alaska State Department of Education, Office of Planning and Research, 1979. (ED 200190).

Graff, Susan M. Alternative Delivery Systems. In K.S. Munshi, Telecourses: Reflections '80. Washington, D.C.: Corporation for Public Broadcasting, 1980. (ED 191115).

Greene, Alexis. Poor Ratings for Two-Way Television. Change, 1979, 2(4), pp.56;72.

Gruebel, Jerold, Robison, W. Neal, & Rutledge, Susan. Directory of Intra-State Educational Telecommunications Systems. Washington, D.C.: Association for Educational Communications and Technology, 1980.

Hague, Syed M.S. Video Applications in Education. Educational Technology, 1978, 18, 28-32.

Instructional Television: A Comparative Study of Satellites and Other Delivery Systems. Syracuse, N.Y.: Educational Policy Research Corp., 1976. (ED 138242).

ITV Close-Up: The First Six Years. Dallas: Dallas County Community College District, 1979. (ED 171361).

ITVA Salary Survey. International Television Association, 1981. Available from D/J Brush Associates, Box 210B-Highland Road, Cold Springs, N.Y. 10516.

Jamison, Dean T. & Klees, Steven J. The Cost of Instructional Radio and Television for Developing Countries. Instructional Science, 1975, 4, 333-384.

Jamison, Dean T., Klees, Steven J., & Wells, Stuart J. Cost Analysis for Educational Planning and Evaluation: Methodology and Application to Instructional Technology. Princeton: Educational Testing Service, 1976. (ED 127918).

_____. The Costs of Educational Media: Guidelines for Planning and Evaluation. Beverly Hills: Sage, 1978.

Kiesling, Herbert. Economic Cost Analysis in Higher Education: University of Mid-American and Traditional Institutions. Educational Communications and Technology, 1979, 27, 9-24.

Lent, Richard M. Program Planning and the Cost-Effectiveness Analysis of Instructional Technologies: A Case Study in Planning Continuing Education Services. Paper presented at the Annual Meeting of the American Educational Research Association, April, 1977. (ED 145801).

Lewis, Raymond J. Meeting Learner's Needs Through Telecommunications: A Directory of Programs. Telescan, 1982, 1(3), pp. 1;5.

Luskin, Bernard J. Telecommunications: A Prism of Access for Adult Learning. Technological Horizons in Education Journal, 1980, 7, 43-50.

McAuliffe, Daniel G. How A College System Joined a TV Network. Community and Junior College Journal, 1978, 48, 40-41.

McCabe, Robert H. The Economics of Television-Centered Courses. In R. Yarrington (Ed.), Using Mass Media for Learning. Washington, D.C.: AACJC, 1979. (ED 165856).

Munshi, Kiki Skagen. Mass Media and Continuing Education: An Overview. New Directions for Continuing Education, 1980a, 5, 1-14.

_____. Telecourses: Reflections '80. Washington, D.C.: CPB, 1980b. (ED 191115).

Munshi, Kiki S., & Stone, David P. Working with Telecourses. University of California San Diego Extension and Coastline Community College, 1980. (ED 194107).

Polcyn, Kenneth A. Communications Satellites for Education and Training: Past, Present, and Future. In J. Curtis and J. Biedenback (Eds.), Educational Telecommunications Delivery Systems. Washington, D.C.: ASEE, 1979.

Richardson, Penelope L. Four Case Studies of Television-Centered Course Development Projects, and their Implications for Education Materials Development. Paper submitted to the National Programming Division, KCET-Channel 28, Los Angeles, CA, 1979. Available from the author at the University of So. California, WPH 701, Los Angeles, CA 90007.

_____. Issues in Television-Centered Instruction for Adults. Paper presented at the Annual Meeting of the American Educational Research Association, April, 1981. Available from the author.

Salary Report for Public Television Licensees 1979-1980. Washington, D.C.: CPB, 1980.

Schramm, Wilbur; Coombs, Philip H.; Kahnert, Friedrich; & Lyle, Jack. The New Educational Media: Memo to Educational Planners. Paris: UNESCO, 1967.

Schramm, Wilbur, Nelson, Lyle, & Betham, Mere. Bold Experiment: The Story of Educational Television in American Samoa. Stanford: Stanford University Press, 1981.

SECA to Feed ITV Schedule; It's Cheaper. Current, 1982, 1(3), pp. 1;7.

Sell, Rodger. Preliminary Cost-Effectiveness Considerations for UMA/SUN, Working Paper No. 4 and Executive Summary No. 4. Lincoln: University of Mid-America, 1975. (Abstract) (ED 159973).

Shulman, Carol Herrnstadt. Instructional Television: Higher Education Without Commercial Interruption. AAHE-ERIC/Higher Education Research Currents, May, 1981. (ED 201262).

Stalcup, Robert J., & Hall, Richard S. The Community Junior College and Instructional Television. 1978. (ED 158802).

Stepp, Thomas L. Comments at the National Conference on Technology and Education. Paper presented at the National Conference on Technology and Education, January, 1981. (ED 205197).

Sovereign, Michael G. Costs of Educational Media Systems. A Series II Occasional Paper from ERIC at Stanford. Stanford University, CA: ERIC Clearinghouse on Educational Media and Technology, 1969. (ED 031092).

Test and Evaluation of Public Service Uses of Cable Television; The NYU Reading (PA) Consortium Progress Report. New York University, N.Y.: N.Y.-Reading Consortium, 1976. (Abstract) (ED 127985).

Van der Drift, Koen. Cost-Effectiveness of Audiovisual Media in Higher Education. Instructional Science, 1980, 9, 355-364.

Wagner, Leslie. Television Videotape Systems for Off-Campus Education: A Cost Analysis of SURGE. Instructional Science, 1975, 4, 315-332.

Walker, Noojin, & Joboulian, Judy. Telecourse Production: Is It Worth the Cost? Journal of Technological Horizons in Education, 1979, 6, 38-39. (Abstract)

West, Peter C. A Survey and Report of Interest In and Availability of Delivery of Instruction by Remote Methods. Rockford Regional Academic Center, Ill., 1980. (ED 192695).

Wood, R. Kent, & Woolley, Robert D. An Overview of Videodisc Technology and Some Potential Applications in the Library, Information, and Instructional Sciences. Syracuse: ERIC Clearinghouse on Information Resources, 1980. (ED 206328).

Young, Michael; Perraton, Hilary; Jenkins, Janet; & Dodds, Tony. Distance Teaching for the Third World. London: Routledge and Kegan Paul Ltd., 1980.

Zigerell, James J., O'Rourke, James S., & Pohrtz, Theodore W. Television in Community and Junior Colleges: An Overview and Guidelines. Los Angeles: ERIC Clearinghouse for Junior Colleges, 1980. (ED 206329).